7.21 MODIFICATIONS THAT MAY BE INCLUDED IN THE GP OPTIONS

As the GP options were being developed, some modifications to two plan components were simulated and the impacts analyzed to determine the potential for including these changes as part of the GP options. The two plan components that were modified in the additional simulation runs were the spring rise and the minimum navigation service releases during the summer low-flow period. Both were evaluated to determine if adverse impacts could be diminished without changing the overall effects of the alternatives.

7.21.1 Constrain Higher Spring Flows while Moving Some Spring Rises to Extended Droughts

Spring rises are limited to the "normal" inflow years according to the BiOp RPA and the subsequent modeling of that alternative and the GP options. These alternatives were modeled with flow targets for the flood control constraints on the Lower River raised by an amount equal to the spring rise. For example, the flow target for the flood control constraint at Omaha is 41 kcfs for the reduction of releases to the full navigation service target. This value was raised by 15 kcfs to 56 kcfs for the GP1528 option, which has a 15-kcfs spring rise release from Gavins Point Dam. Because of the flood control constraints, spring rises do not occur in years with high tributary flows in the reaches between Sioux City and Kansas City. Also, the spring rise was generally suspended in the second year of an extended drought, and it was not reinitiated until system storage had recovered following the drought.

Even with constraints on the spring rise in high Lower River inflow years, crop damages via groundwater level increases and interior drainage blockages increased for these alternatives over that of the CWCP. Two potential solutions were combined and evaluated to determine their impacts on the crop damage risk.

To ensure that there would be an adequate number of spring rises, which was approximately one-third of the time, the restriction on spring rises in droughts was relaxed. Second, to reduce the crop damage risk, the flood control constraints were not increased by the same amount as the spring rise increase. Instead successive model runs, or simulations, were made beginning with no change in constraint to runs with greater and greater limitations on the amount that the flood control constraints were raised. The base simulation selected for the analysis had a spring rise of 17.5 kcfs followed by a flat release of 28.5 kcfs for minimum navigation service. This simulation was labeled FWMS. Subsequent runs were made with lower and lower flood control constraint increases. These were labeled FC0 (no reduction in flood control constraints) FC1, FC2, and FC3. Figure 7.21-1 shows the resulting spring rises on a duration plot. It shows that the FC0 run and subsequent runs with lower flow values for the flood control constraints had generally the same number of spring rises, with a slight reduction in the duration of the spring rise in the 45 to 55 percent range for the FC3 run. This figure demonstrates that there was essentially no loss in the number of years in which spring rises were provided. This plot also shows that these runs had more spring rises of 14 days or longer than the BiOp alternative (see Chapters 4 and 5), which was the alternative included in the BiOp RPA.

Figure 7.21-2 shows a second duration plot of the number of days in May that the flow at Levee Unit L575 was 55 kcfs (flow at which interior drainage begins to be impacted) or greater. This levee unit was selected for this discussion because it had the greatest interior drainage and groundwater damages resulting from the spring rise (Sections 5.8.2, 5.8.3, 7.8.2, and 7.8.3). This figure shows that the number of years with flows of 55 kcfs or greater was reduced from over 80 percent to about 70 percent. More significantly, the number of days the flow was greater than 55 kcfs was reduced by about 50 percent. The number of days was still greater than the MCP, which is also shown on the figure. The percent of years with the number of days greater than 6 (out of 31 days in May) was nearly the same (generally zero to 5 percent more for FC3) as those of the MCP.

Figure 7.21-3 shows a plot of the number of days in May and June with discharges greater than 45 kcfs (potential spring rise occurrences) under the BiOp alternative, and Figure 7.21-4 shows a similar plot with the higher releases included in the extended droughts under the FC3 option. The second plot shows that there is a more even distribution of higher releases throughout the 100-year period of analysis. Under the BiOp alternative, no spring rises occur during or immediately after the three major droughts—from 1931 through 1946, 1954 through 1966, and 1988 through 1995. These gaps are 16, 13, and 8 years long, respectively. The longest gap without at least 10 days with 45 kcfs or more under the FC3 alternative was 1989 through 1994, or 6 consecutive years. There are also 5 more years that the FC3 alternative had at least 14 days that the Gavins Point Dam releases exceeded 45 kcfs (29 for the BiOp alternative and 34 for FC3).

The bottom line on the hydrologic aspects of this analysis is that the number of years with high spring releases goes up when the drought constraints are removed and the flood control constraints on the Lower River are tightened. These years are more evenly spread over the 100-year period of analysis with much shorter gaps between high flows. Furthermore, the percent of years with flows equal to or greater than 55 kcfs at Nebraska City for more than 5 days in May are nearly the same for the FC3 and MCP simulations.

The analysis was taken a step further to determine if there were differences in the average annual impacts for those uses or resources that were easily modeled (i.e., not interior drainage and groundwater effects). Tables 7.21-1 and 7.21-2 present the results of the economic use and environmental analyses, respectively. It is readily apparent that there is essentially no difference in the average annual impacts to these uses and resources. This indicates that the aforementioned hydrologic benefits in terms of high spring flows can be attained with relatively small differences in the economic use and environmental resources benefits over the 100-year period of analysis.

7.21.2 Switch to Navigation Targets to Conserve Water in the System During Extended Droughts

All of the alternatives in Chapter 7 were run with flat releases or the split-navigation release of 25/21 kcfs. In many drought years, the flat releases used more water than was required to meet navigation service. In other years, not enough water was released to meet the targets in every day of the flat-release period. This demonstrates that the actual value for the flat release would need to be determined each year, using conditions (wet or dry) of the portion of the basin feeding directly into the river as a basis for setting the release rate. This differs from how the alternatives were modeled with a set flat release of either 34.5 kcfs for full navigation service, 28.5 kcfs for minimum navigation service. Another way to potentially save

Table 7.21-1. Average annual economic benefits of flood control alternatives and two GP options relative to the CWCP (percent).

	Flood Control	Navigation	Hydropower	Water Supply	Recreation	Total NED
GP1528	-1	-24	2	0	4	1
GP2021	-1	-32	2	0	2	0
FWMS	-1	-23	2	0	5	1
FC0	-1	-27	2	0	4	1
FC1	-1	-27	2	0	4	1
FC2	-1	-27	2	0	4	1
FC3	-1	-26	2	0	4	1

Table 7.21-2. Average annual environmental effects of flood control alternatives and two GP options relative to the CWCP (percent).

	Fish Production	Coldwater Reservoirs	Coldwater Rivers	Warmwater Rivers	Physical Habitat	Tern & Plover Habitat	Wetland Habitat	Riparian Habitat	Historic Properties
GP1528	6	9	7	-16	1	68	2	-4	-6
GP2021	7	9	7	-15	1	74	1	-4	-6
FWMS	5	6	7	-13	1	51	1	-5	-5
FC0	5	6	7	-14	1	69	3	-6	-4
FC1	6	8	7	-15	1	66	4	-6	-5
FC2	7	8	7	-15	1	73	3	-5	-5
FC3	8	9	7	-16	0	76	1	-4	-6

water in the lakes while fully serving navigation every day is to go to target releases all summer long. A recommendation was made by the ACT to go to target releases in the summer of 2001. It was determined that sufficient habitat existed in the river below Gavins Point Dam so that, even with increasing releases through the summer to meet the navigation target, fledge ratio and population goals of the two listed birds would be met. Lower River direct inflows were very high during the early portion of the normal flat release period, and considerable water was saved during May through July. This operation had little noticeable effect on the birds, as the fledge ratio was again met in 2001 for the reach downstream from Gavins Point Dam.

The 1954 to 1961 and the 1987 to 1993 droughts had several years that the flat release used more water than required to serve navigation without missing targets all summer. Historically, opportunities exist to set the flat releases lower than modeled. Conversely, if the tributaries to the Lower River turn out to be much drier than anticipated, the flat release could be set too low, and navigation targets may not be met for some extended periods in the summer. To increase the potential for saving water while ensuring that the navigators have adequate water to meet targets, the releases may be based periodically on targets instead of flat releases. The ACT and Corps staff would consider many factors as the tern and plover nesting season approaches during extended droughts. If a spring rise were to occur in the May and June timeframe, the potential for having to take actions, such as picking up eggs in nests that may be flooded, would be minimized as long as adequate habitat existed at relatively high flows so that the birds could nest during the high-flow period. Water could then potentially be saved during the post-high-flow period if target releases were followed in such a way that the net use of water may be comparable to having a flat release all summer.

When this mode of operation was modeled and the impacts computed, differences in the average annual values occurred throughout the drought period. This indicates that changing the release pattern makes a difference. It is apparent that such a mode of operation would need to be acceptable to the many interests that rely on lake levels and river flows. The ACT and basin stakeholders would need to concur in the switch to navigation targets should any of the alternatives other than those that do not serve navigation during the summer become the selected water control plan.

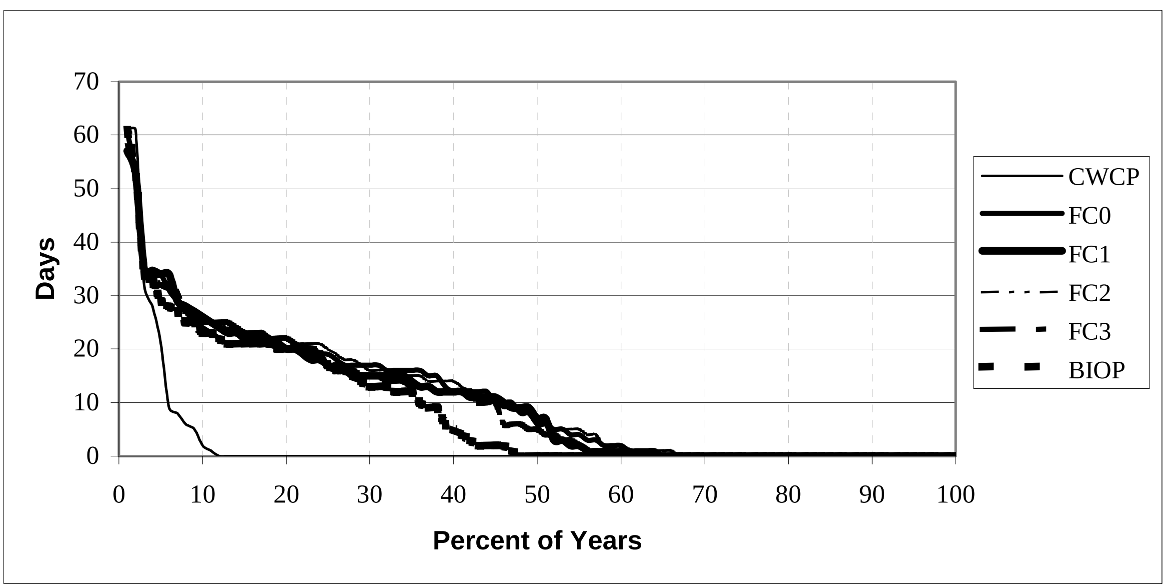

Figure 7.21-1. Duration plot of the total number of days in May and June releases from Gavins Point Dam exceed 45 kcfs.

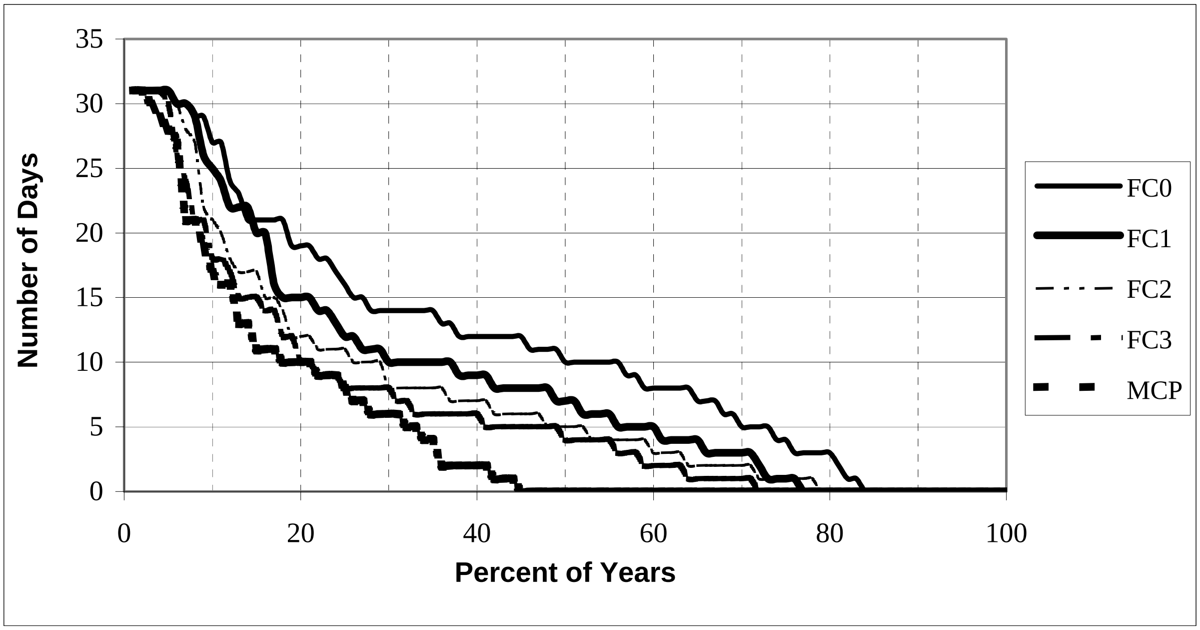

Figure 7.21-2. Duration plot of the number of days flows exceed 55 kcfs at Nebraska City during May.

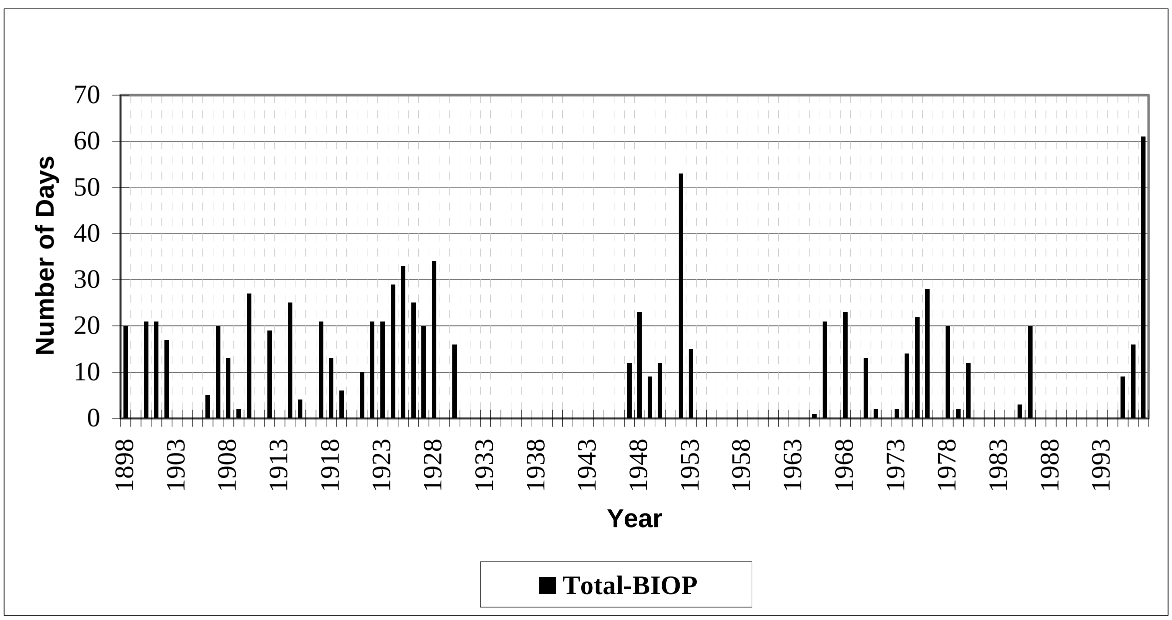

Figure 7.21-3. Total number of days in May and June releases from Gavins Point Dam equaled 45 kcfs or greater for the BIOP alternative.

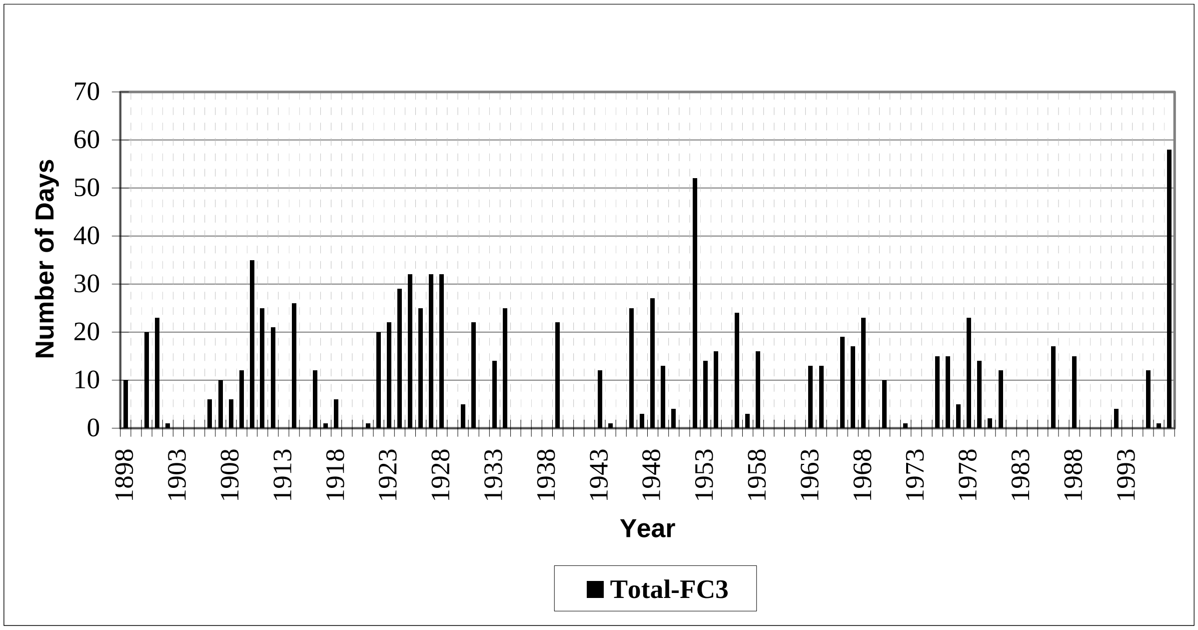

Figure 7.21-4. Total number of days in May and June releases from Gavins Point Dam equaled 45 kcfs or greater for the FC3 alternative.

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